



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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Portland, Oregon 97232

JUL 24 1985

## Memorandum

To: Regional Director, Mid-Pacific Region, Bureau of Reclamation  
Sacramento, California

From: Regional Director, Region One, Fish and Wildlife Service,  
Portland, Oregon

Subject: Elevated Sacramento River Flow During May 1985 to Benefit  
Downstream Migrant Chinook Salmon

Through your assistance, the Bureau of Reclamation increased releases of water from Shasta and Keswick dams over a 3-day period during May of this year to assist young chinook salmon in their migration from the upper Sacramento River to the ocean. I wish to commend the Bureau for cooperating with the Service and the California Department of Fish and Game (DFG) in our efforts to minimize the losses of young salmon in the upper Sacramento River. Although final data on the flushing flow operation will not be available until the fall of 1987 when tagged salmon released this spring will eventually be recovered, our preliminary data indicate the increased flow significantly benefited this spring's salmon outmigration. A detailed evaluation of the data collected thus far will be presented this fall in the Service's annual report on biological aspects of the Bureau-sponsored Fish Passage Action Program for Red Bluff Diversion Dam (RBDD). However, for your information, the following is an overview and some preliminary results of the fishery-related portions of the flushing flow operation.

By 10 p.m. May 13, 1985, releases from Keswick Dam had been increased from 9,000 to 14,000 cfs. At 3 a.m. May 14, 4.3 million young salmon (including 66,000 coded-wire tagged salmon) were released from Coleman National Fish Hatchery into Battle Creek. By that time, the increased river flow had reached the Battle Creek-Sacramento River confluence. These fish moved downstream rapidly averaging 1.7 miles per hour.

The bulk of the downstream migrant salmon reached Red Bluff Diversion Dam shortly after 10 p.m. on May 14 (19 hours following their release from Coleman Hatchery). As you can see from Figure 1, the Service's riverine trawl samples just above the dam were highest during this time period and declined rapidly shortly thereafter. Similar sampling the following

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night showed that most of the fish passed the dam the first night following the increased Keswick release. The Bureau's practice of turning off RBDD's bright sodium-vapor lights at night was beneficial to young salmon passing the dam at night. Service biologists in the vicinity of the dam during the two nights following the fish release used a "starlight scope" (a device enabling the user to see clearly in darkness) and observed no squawfish feeding activity on young salmon downstream of the dam. In the past, this feeding activity has been readily visible when young salmon pass the dam during daylight. Based on these results, we believe the attempt to move young salmon rapidly past RBDD in darkness with the flushing flow operation was successful. It will take some time to evaluate the RBDD gate manipulation aspect of the flushing flow operation; that information will be presented in the Service's annual progress report on the Fish Passage Action Program for RBDD.

Various studies have shown that an area in the upper Sacramento River where squawfish are a significant problem to young salmon is immediately downstream of RBDD; there they can easily prey on downstream migrant salmon disoriented by passing under the dam gates. An unanticipated benefit of the flushing flow operation was evident when over 10,000 adult squawfish were counted passing RBDD through the fish ladders during the daytime on May 14, whereas the week prior to May 14 an average of only 13 squawfish per day passed the dam. The immediate effect of the increased river flow obviously induced large numbers of squawfish downstream of RBDD to migrate and move upstream past the dam. The significance of this is that over 10,000 predators were removed from the vicinity immediately below the dam just prior to the time when the bulk of the downstream migrant salmon reached the dam. It therefore appears that the flushing flow operation was successful not only in moving the salmon quickly past RBDD in darkness, but also effectively removed predatory fish from a location where they could do the most damage to the young salmon. This combination minimized salmon losses at the dam.

An additional hazard for downstream migrant salmon avoided due to the flushing flow operation was the ineffective fish screens near the intake to Glenn-Colusa Irrigation District's (GCID) irrigation canal. Based on the young salmon's measured rate of downstream travel, most of the fish passed the GCID screens the evening of May 15. California Department of Fish and Game personnel observed a large positive bypass flow at the GCID fish screens from May 15 through May 17 where previously only a small, ineffective bypass flow was present. This was further substantiated by GCID personnel when they measured a bypass flow of 481 cfs past the screen on May 16. On that same day, Service SCUBA divers made an underwater inspection of the vicinity immediately in front of the entire length of the GCID screens and observed no predatory fish or young salmon. The effort of minimizing pumping at the GCID pumps by wheeling water through the Tehama-Colusa Canal and from Black Butte Reservoir, in conjunction with the increased releases from Keswick was considered very successful in creating a substantial bypass flow past the GCID fish screens concurrent with the arrival of most of the downstream migrants. Based on these

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preliminary findings, we believe these measures substantially reduced or eliminated salmon losses in the vicinity of the GCID fish screens for that time period.

Sampling with trawling gear near the mouth of the Sacramento River by Service and DFG personnel during and following the flushing flow operation provided additional information on the passage time and relative survival of the smolts from the upper river to the Sacramento Delta. The best indication of the passage of Coleman Hatchery smolts through the Delta was provided by recoveries of coded-wire tagged juvenile salmon released in the upper Sacramento River during the period of elevated flow. Recoveries of these fish indicated that most of the Coleman Hatchery fish reached the mouth of the Sacramento River on May 22, eight days following the main fish release at the hatchery with an average travel time of 1.4 miles per hour (see Figure 2). Preliminary data on trawl samples of untagged juvenile salmon also indicate that most of the young salmon migrating from the upper Sacramento River to the Delta during the elevated flow period reached the mouth of the Sacramento River at a similar time. A preliminary evaluation of the Delta trawling data indicated that fish released in the upper Sacramento River during the flushing flow survived the migration to the Delta at a relatively high rate.

The flushing flow operation conducted during May of this year to assist young salmon in their migration from the upper Sacramento River to the ocean was an unprecedented measure for fishery restoration in that basin. Larger scale, somewhat similar operations mandated by Congress for the Columbia River have recently been demonstrated to be particularly beneficial for downstream migrant salmonids in the Columbia basin. The Service believes the Bureau's flushing flow operation this spring is definitely a step in the right direction and we are sincerely appreciative of the Bureau's voluntary efforts to assist whenever possible in fishery restoration programs in California. Your cooperative efforts will certainly benefit anadromous salmonid resources in northern California.

Sincerely,

Original signed by  
Joseph R. Blum

Richard J. Myshak  
Regional Director

cc: California Dept. of Fish & Game  
National Marine Fisheries Service  
ARD-HR  
Sacramento ES Field Office  
Coleman NFH  
Tehama-Colusa FF  
Red Bluff FAO  
Stockton FAO

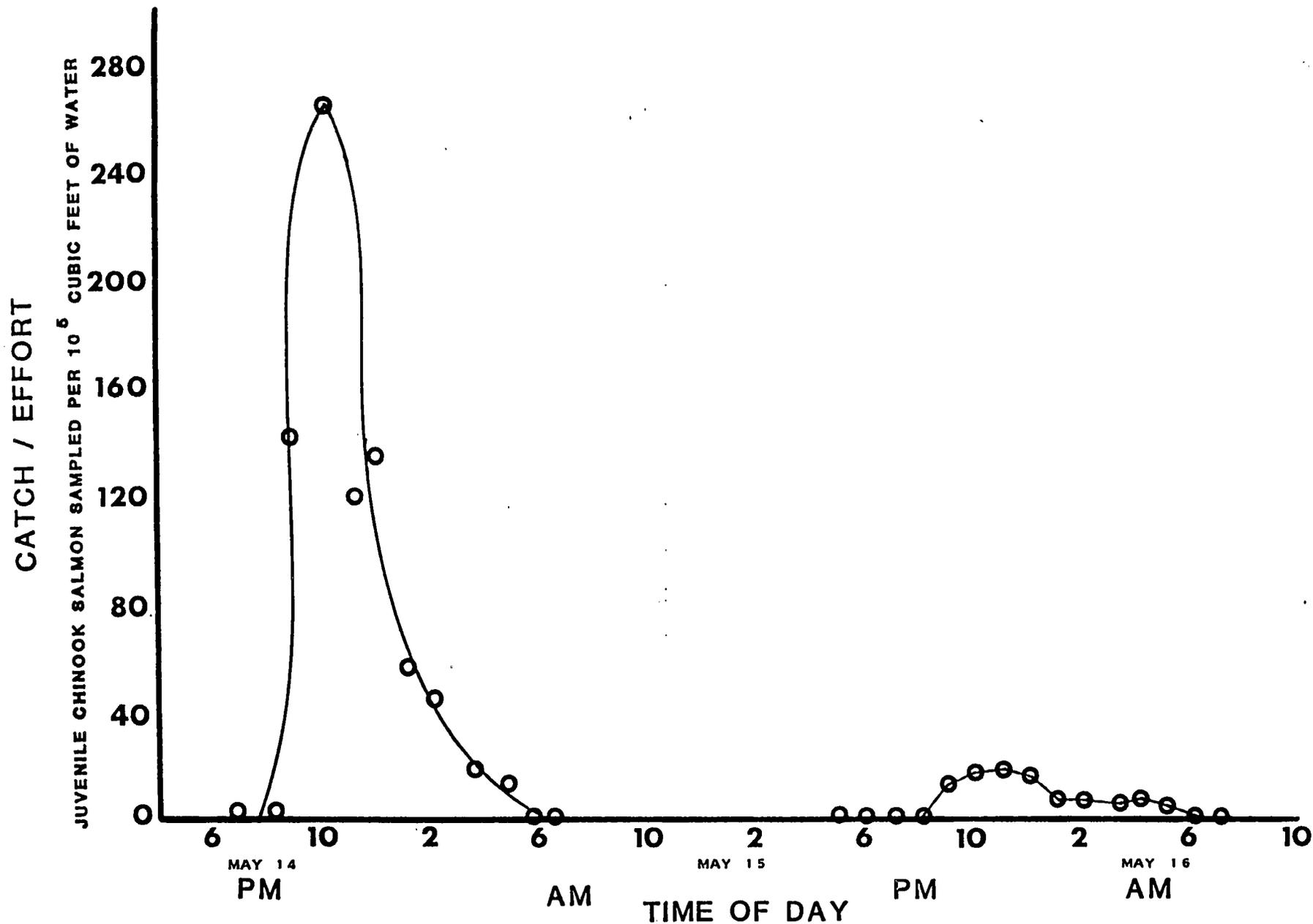


Figure 1. Outmigration pattern of juvenile chinook salmon past Red Bluff (as determined by riverine trawl samples) following a 3 a.m. release of 4.3 million smolts from Coleman National Fish Hatchery, 33 miles upstream, May 14, 1985.

NUMBER OF TAGGED CHINOOK SALMON CAPTURED AT CHIPPS ISLAND

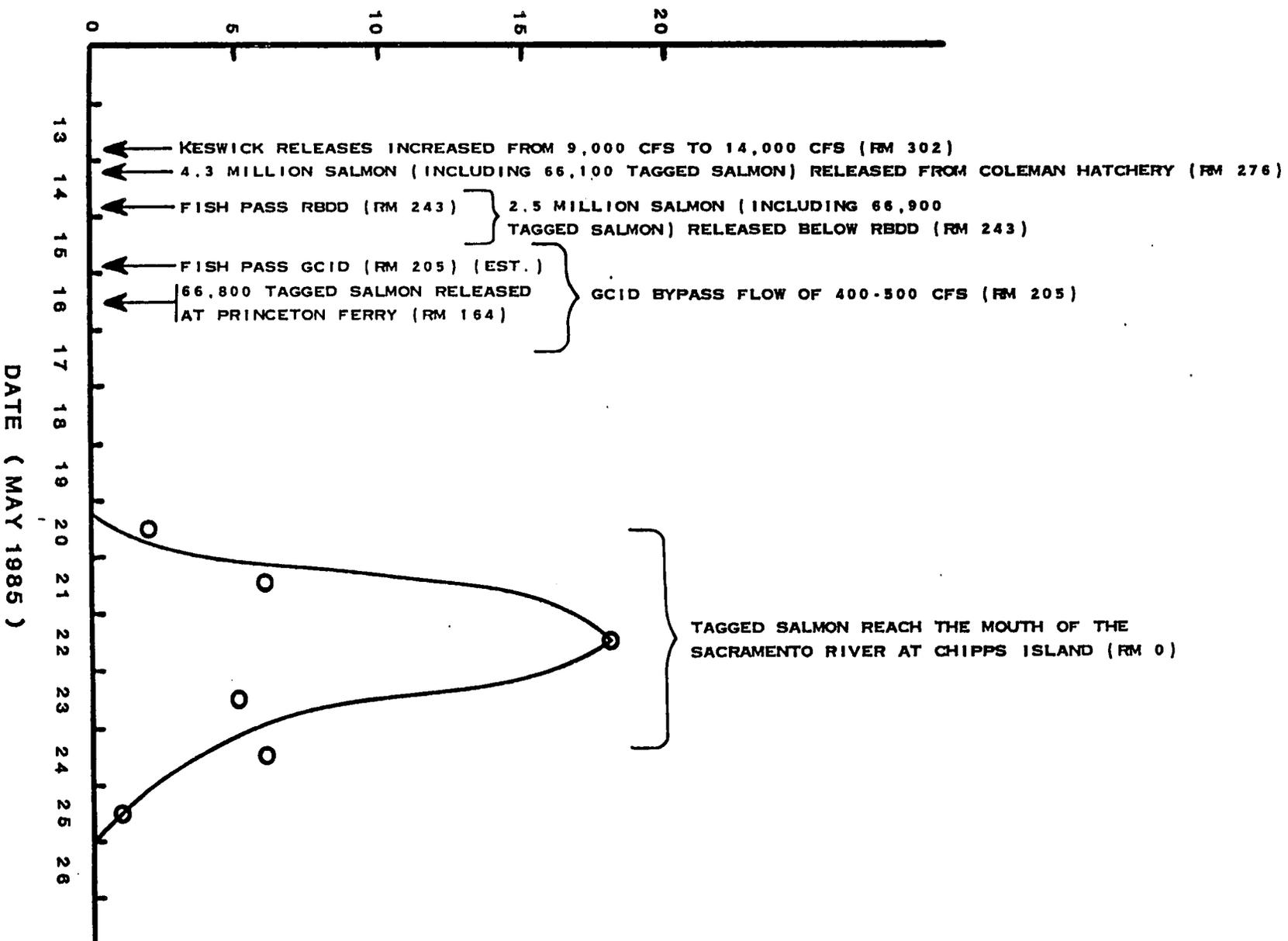


Figure 2. Trawl recoveries of coded-wire tagged juvenile chinook salmon at the mouth of the Sacramento River (Chipps Island - River Mile 0) following juvenile salmon releases in the upper Sacramento River (R1 276-164) on May 14-16, 1985.